CI Nowcasting at DLR – Snapshots of ongoing research

by Dennis Stich

2012 Convection Working Group meeting, 27-30 March 2012, Prague

Motivation

Aviation purposes

Cb-TRAM as basic tool

Adding non-satellite fields for further development

NOT(!) especially for forecasters

General idea

Basic Tool (Cb-TRAM) ⟷ Verification

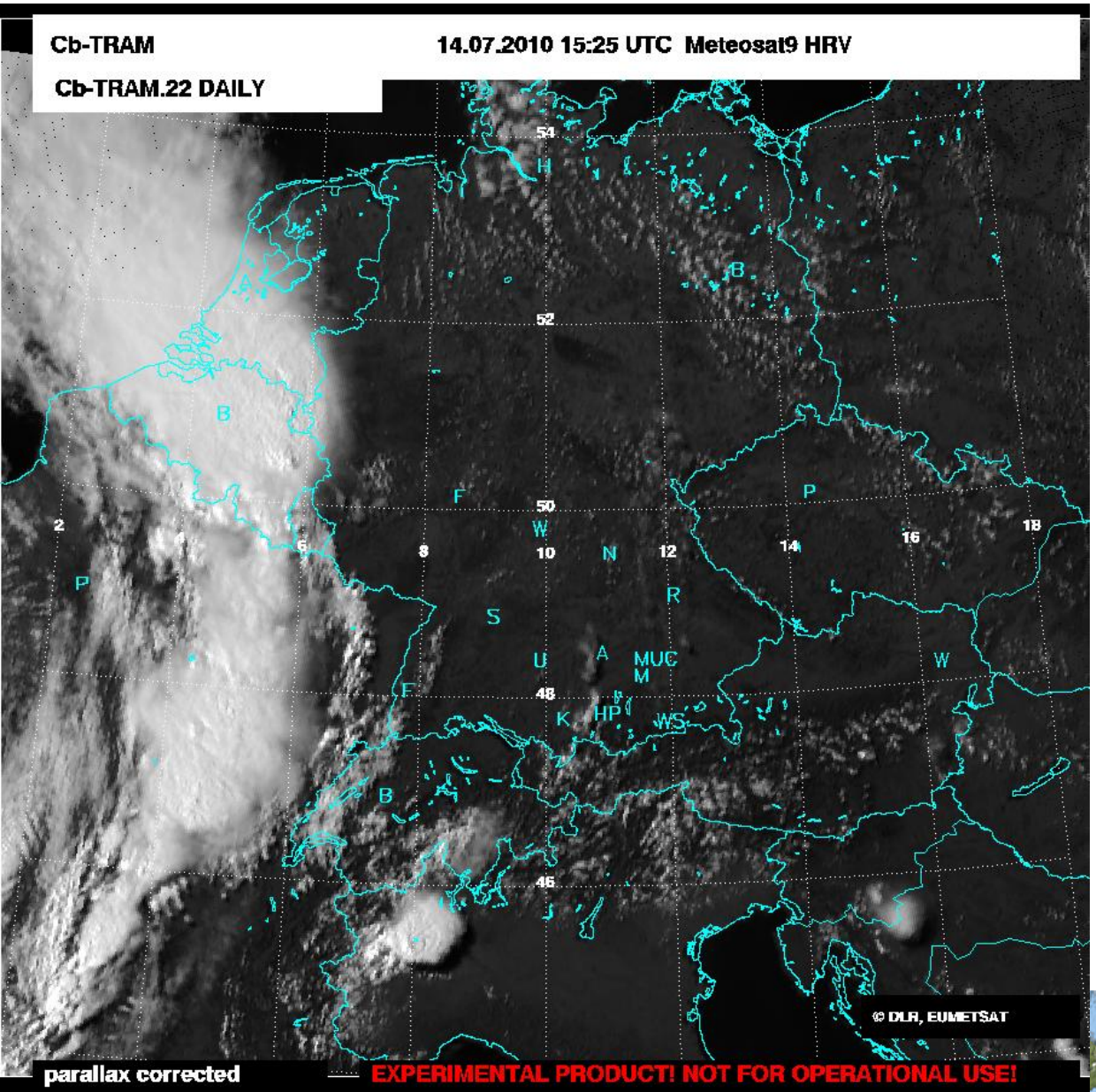
↓ Data Fusion

Cb-TRAM + Additional data ⟷ Verification

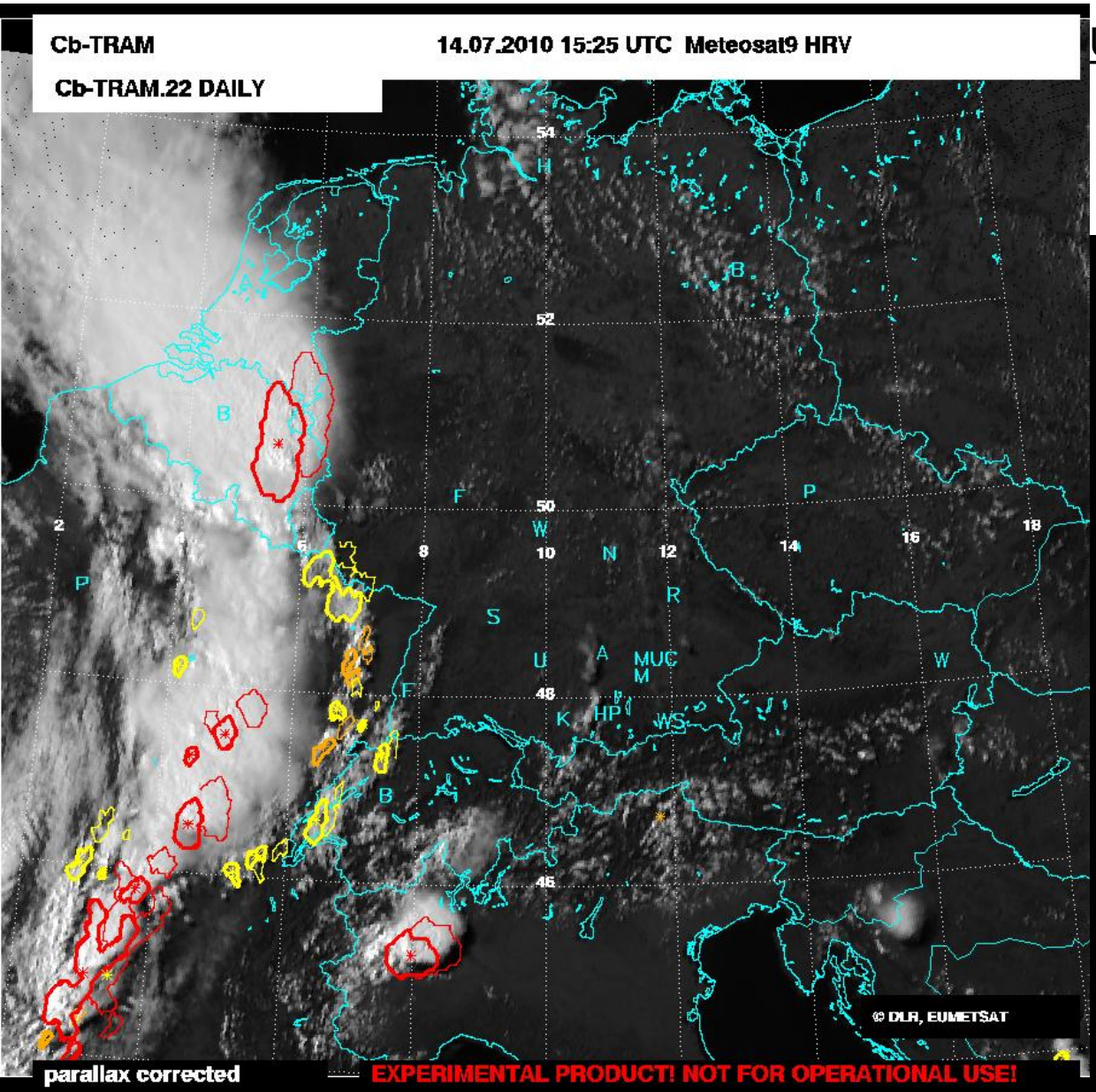
↓

CI-NOW – a CI detection and nowcasting tool

Cb-TRAM - Cumulonimbus TRacking And Monitoring



Cb-TRAM - Cumulonimbus TRacking And Monitoring



Used MSG (rapidscan) data:

WV 6.2	IR 10.8
IR 12.0	HRV

Detection stages:

1: Convection Initiation (CI)
- development in HRV
- IR 10.8 cooling

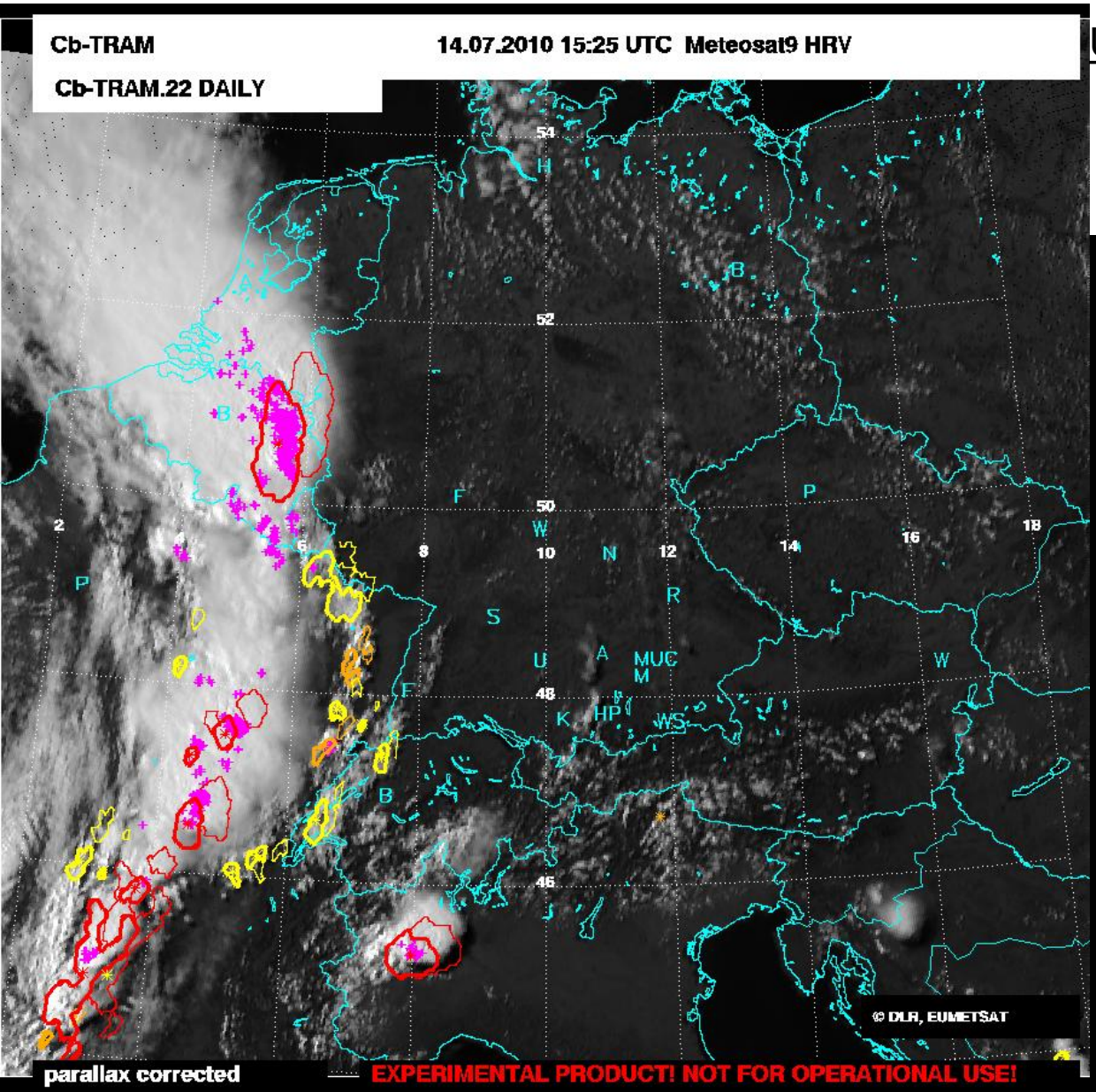
2: Rapid development
- WV 6.2 rapid cooling (> 1K/15min)

3: Mature storms
- T 6.2 - T 10.8
- HRV texture

Extrapolation up to 60 min
(here 30 minute nowcast plotted)

Description: Zinner et al., 2008

Cb-TRAM - Cumulonimbus TRacking And Monitoring



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Lightning (LINET)

Extrapolation up to 60 min
(here 30 minute nowcast plotted)

Description: Zinner et al., 2008

CI-Verification

Changed a bit,
Improved a bit,
and now skipped due to lack of time !!

Additional data sources

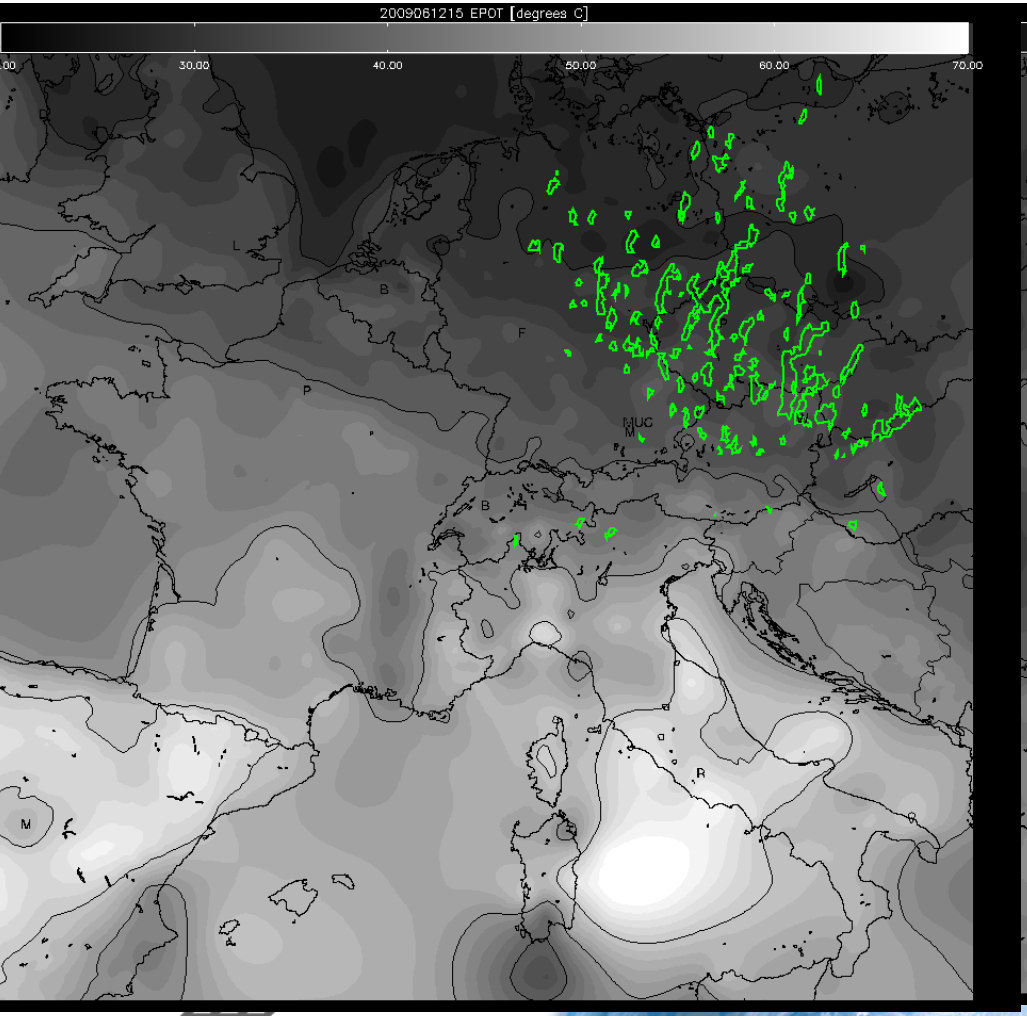
Testing the additional information provided by:

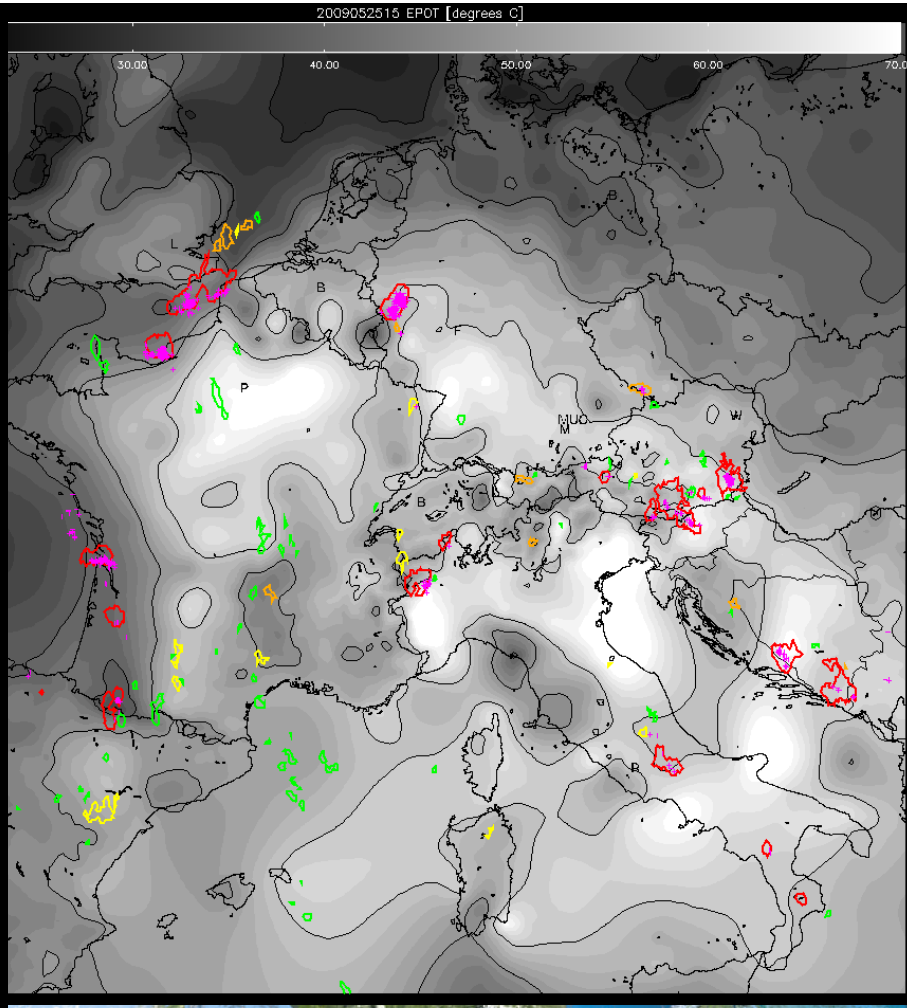
- more satellite channels (SATCAST IFs)
- LINET data
- VERA data
  (e.g. MFC, equivalent potential temperature)
- COSMO-EU data
  (e.g. updraft, KO-Index)
- COSMO-DE data
  (e.g. thunderstorm probability)

More information and references:

www.univie.ac.at/amk/vera/

V ienna E nhanced R esolution A nalysis

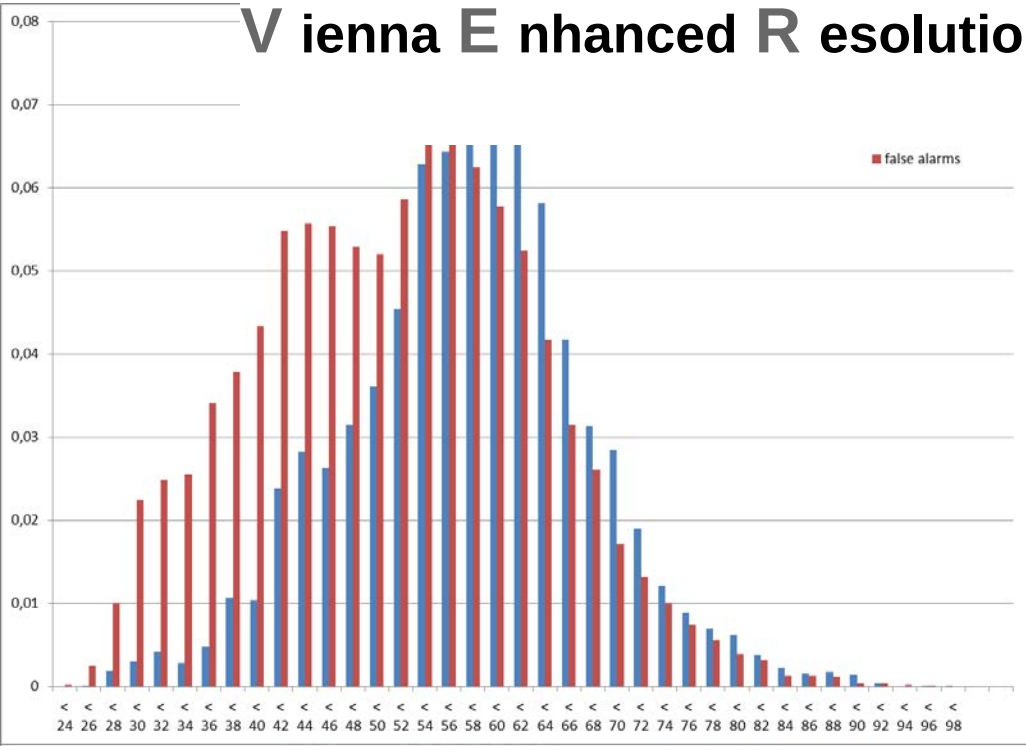


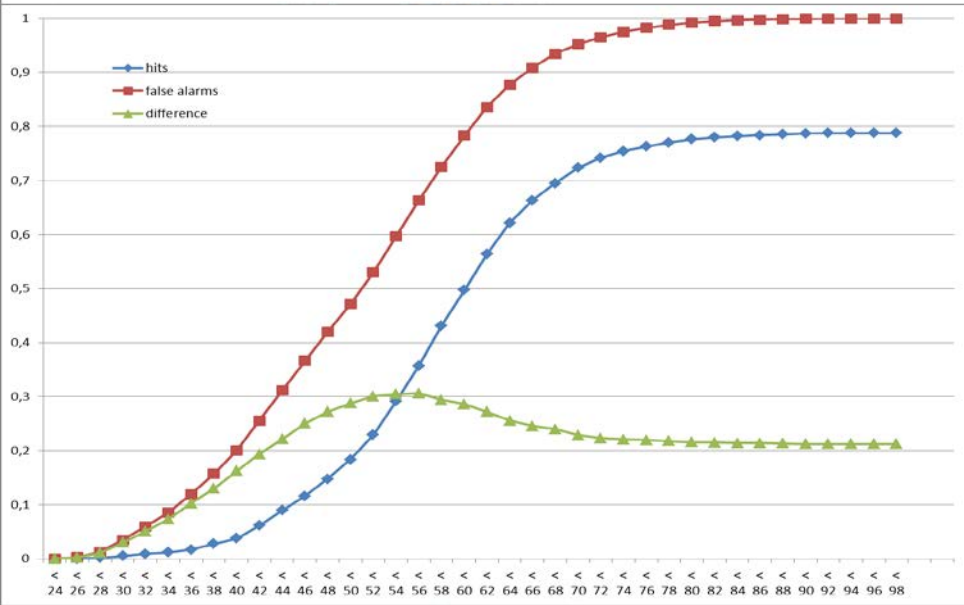


θe June 12 2009 15 UTC

θe May 25 2009 15 UTC

V ienna E nhanced R esolution A nalysis





More information and references:

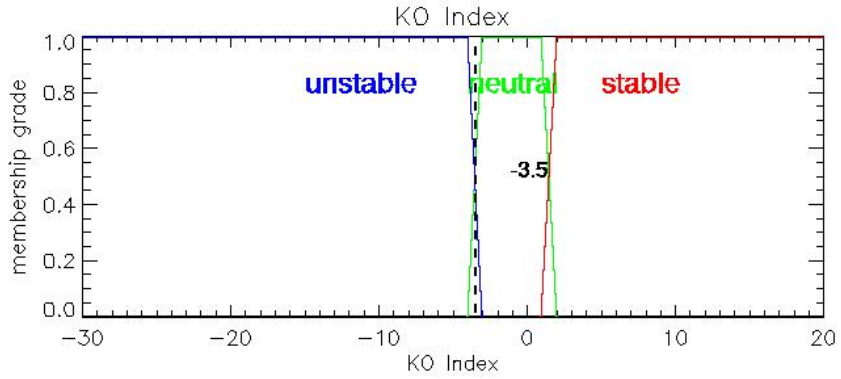
www.univie.ac.at/amk/vera/

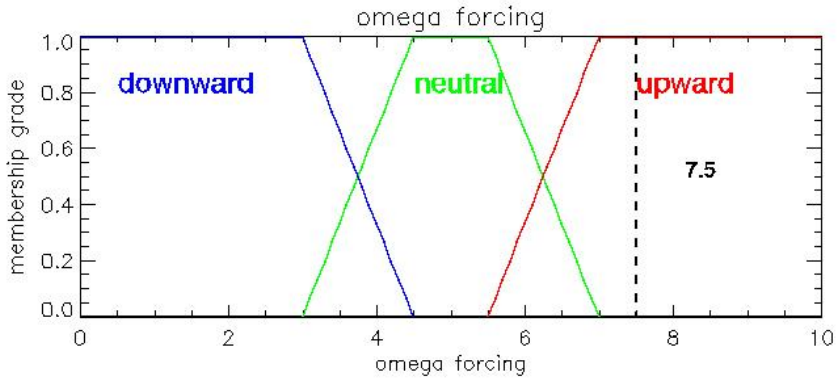
Statistics calculated for ~ 35.000 CI cells over 87 days in summer 2009 (May 15 - 31 August)

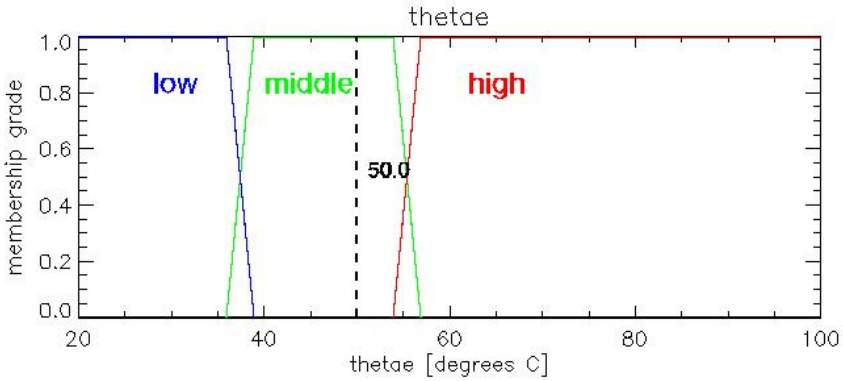
θe < 36 °:
1.7 % of all hits
12.0 % of all false alarms

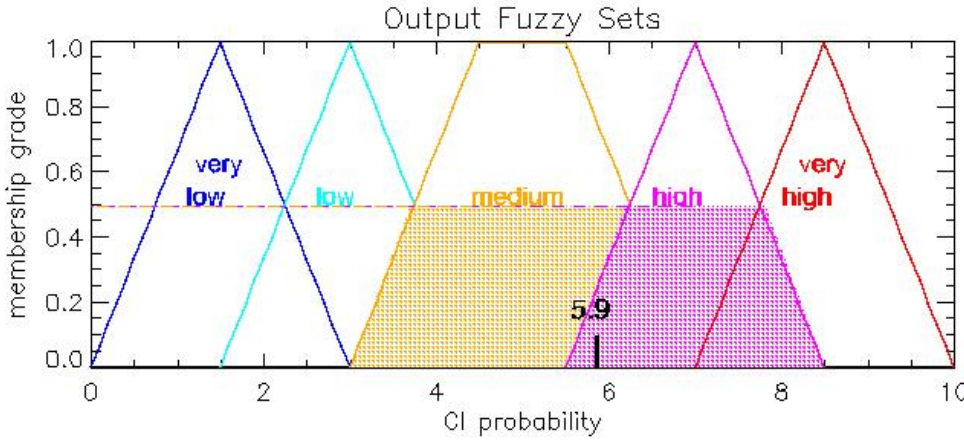
θe < 41 °:
4.8 % of all hits
22.7 % of all false alarms

Fuzzy Logic


KO Index
unstable
neutral
stable
-3.5
membership grade
KO Index


omega forcing
downward
neutral
upward
7.5
membership grade
omega forcing


thetae
low
middle
high
50.0
membership grade
thetae [degrees C]


Output Fuzzy Sets
very low
low
medium
high
very high
5.9
membership grade
CI probability

Aims

Reduce the amount of „false alarms“ substantially

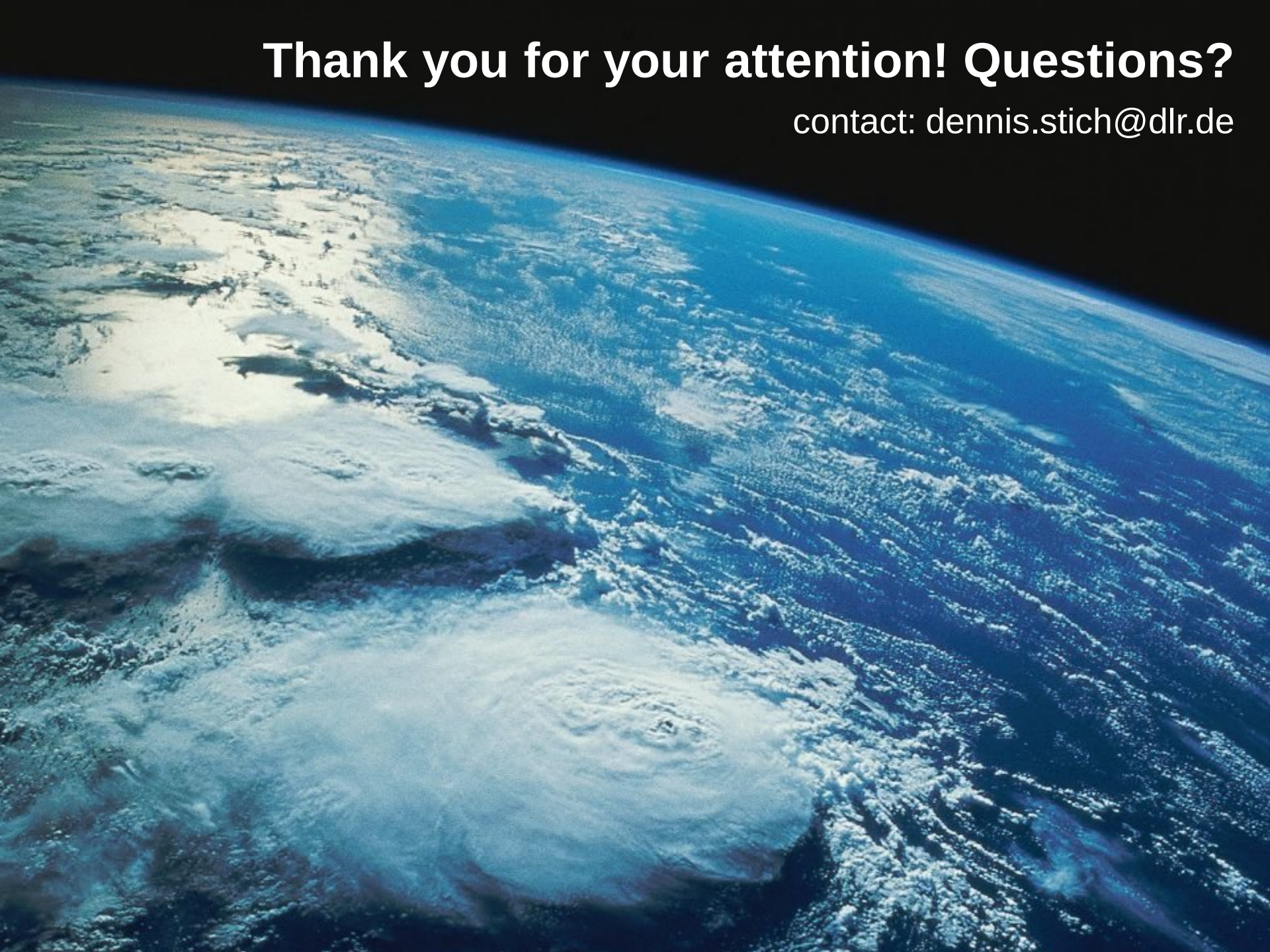
Losing as few „hits“ as possible

Using just data where the gain is abundantly clear due to:

- save processing time
- stay easily traceable (selection of data)

Thank you for your attention! Questions?

contact: dennis.stich@dlr.de

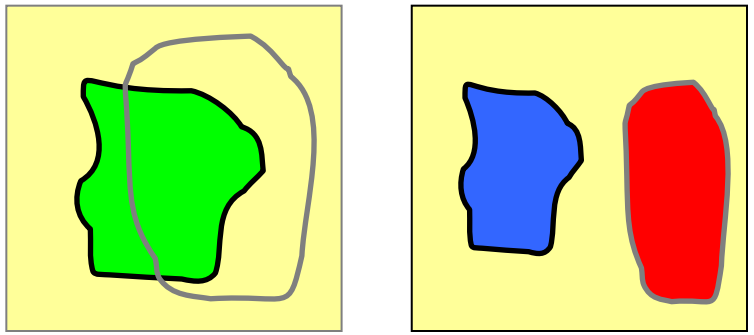


CI-Verification

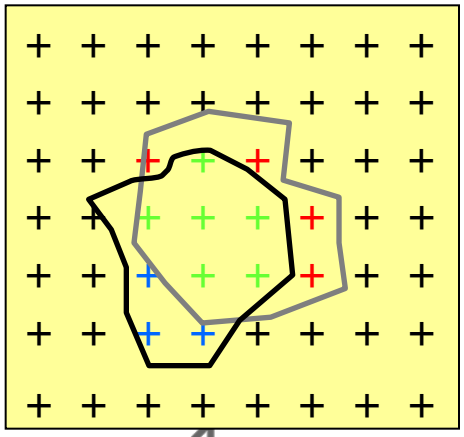
Contingency table

		Observed: yes	Observed: no
Forecast	yes	hit	false alarm
	no	miss	correct negative

Object based



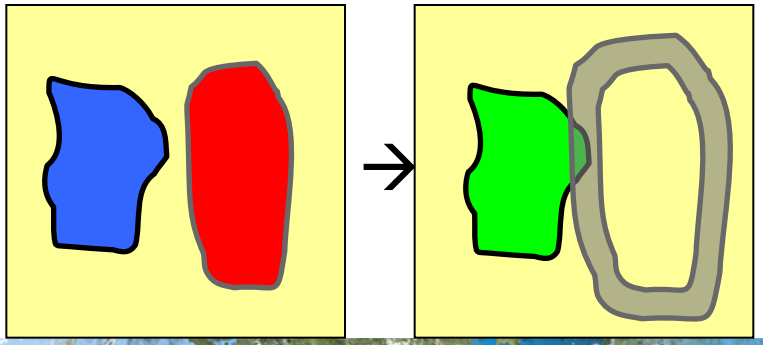
double penalty problem



Pixel based

Requires perfect matching!

Fuzzy + Object based



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Cb-TRAM analysis used for comparison with the 15, 30, 45, and 60 minutes CI-stage nowcasts and nowcasttracks

Object based